What Is Claimed Is:

1. A method for attenuating water layer multiples from a gather of seismic data traces, comprising:

predicting a plurality of receiver side water layer multiples in the gather of seismic data traces using a convolutional operator derived from a water layer model;

adaptively subtracting the receiver side water layer multiples from the gather of seismic data traces;

predicting a plurality of source side water layer multiples using the convolutional operator derived from the water layer model; and

adaptively subtracting the receiver side water layer multiples and the source side water layer multiples from the gather of seismic data traces to generate a plurality of primaries in the gather of seismic data traces.

2. The method of claim 1, wherein predicting the plurality of receiver side water layer multiples comprises:

forming the gather of seismic data traces in a t-x domain;

transforming the gather of seismic data traces from the t-x domain to a tau-p domain; and

convolving the gather of seismic data traces with a convolutional operator to predict the receiver side water layer multiples.

3. The method of claim 2, wherein predicting the source side water layer multiples comprises:

removing a water bottom primary from the gather of seismic data traces; and

convolving the convolutional operator with the gather of seismic data traces after the receiver side water layer multiples have been adaptively subtracted from the gather of seismic data traces and after the water bottom primary has been removed from the gather of seismic data traces to predict the source side water layer multiples.

4. The method of claim 2, wherein the gather of seismic data traces is transformed to the tau-p domain using a linear Radon transform.

5. The method of claim 3, further comprising:

adding the receiver side water layer multiples to the source side water layer multiples;

transforming the sum of the receiver side water layer multiples and the source side water layer multiples from the tau-p domain to the t-x domain.

6. The method of claim 5, wherein adaptively subtracting the receiver side water layer multiples and the source side water layer multiples from the gather of seismic data traces comprises adaptively subtracting the sum of the receiver side water layer multiples and the source side water layer multiples in the t-x domain to generate the primaries in the gather of seismic data traces in the t-x domain.

7. The method of claim 3, wherein removing the water bottom primary comprises replacing each amplitude associated with the water bottom primary with zero.

8. The method of claim 3, wherein the sum of the receiver side water layer multiples and the source side water layer multiples is transformed to the t-x domain using an inverse linear Radon transform.

9. The method of claim 1, wherein the convolutional operator is computed using a zero offset two-way travel time in a water layer and a reflectivity at a water bottom estimated from the water layer model.

10. The method of claim 9, wherein the convolutional operator is the estimated value of the water bottom reflectivity shifted in time by the estimated value of the travel time in the water layer in the tau-p domain.

11. A method for attenuating water layer multiples from a gather of seismic data traces, comprising:

forming the gather of seismic data traces in a t-x domain;

transforming the gather of seismic data traces from the t-x domain to a tau-p domain;

convolving the gather of seismic data traces with a convolutional operator to predict a first set of water layer multiples in the gather of the seismic data traces;

adaptively subtracting the first set of water layer multiples from the gather of seismic data traces;

removing a water bottom primary from the gather of seismic data traces;

convolving the convolutional operator with the gather of seismic data traces after the first set of water layer multiples has been adaptively subtracted from the seismic data traces and after the water bottom primary has been removed from the gather of seismic data traces to predict a second set of water layer multiples in the gather of seismic data traces;

adding the first set of water layer multiples to the second set of water layer multiples;

transforming the sum of the first set of water layer multiples and the second set of water layer multiples from the tau-p domain to the t-x domain; and

adaptively subtracting the transformed sum of the first set of water layer multiples and the second set of water layer multiples from the gather of seismic data traces in the t-x domain to generate a plurality of primaries in the gather of seismic data traces.

12. The method of claim 1, wherein the first set of water layer multiples comprises one or more receiver side water layer multiples.

13. The method of claim 1, wherein the second set of water layer multiples comprises one or more source side water layer multiples.

14. The method of claim 1, wherein removing the water bottom primary comprises replacing each amplitude associated with the water bottom primary with zero.

15. The method of claim 1, wherein the plurality of seismic data traces is transformed to the tau-p domain using a linear Radon transform.

16. The method of claim 1, wherein the convolutional operator is derived from a water layer model.

17. The method of claim 1, wherein the convolutional operator is derived from a zero offset two-way travel time in the water layer and reflectivity at a water bottom estimated from a water layer model.

18. A method for generating a convolutional operator configured to be applied to a gather of seismic data traces, comprising:

generating an estimated value of a zero offset two-way travel time in a water layer and an estimated value of a water bottom reflectivity from a water layer model; and

computing a convolutional operator using the estimated values of the zero offset two-way travel time and the water bottom reflectivity.

19. The method of claim 18, wherein the convolutional operator is configured to convolve with the gather of seismic data traces to predict a set of multiples in the gather of seismic data traces.

20. The method of claim 18, wherein computing the convolutional operator comprises shifting the estimated value of the water bottom reflectivity in time by the estimated value of the travel time in the water layer in the tau-p domain.